Launch Test Range Systems (LTRS)

SLRSC Corrosion Control Program

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Outline

- SLRSC Mission/Overview
- Corrosion Environment and Impacts
- Historical Perspective
- SLRSC Metalizing Program
- Process Standards
- The Metalizing Process
- System Preparation
- Benefits

Program Description

- The SLRSC contractor provides systems development and sustainment support for both the Eastern Range and Western Range.

- Support includes Level 2 & depot maintenance, sustaining engineering, configuration management, systems engineering, development & integration for both ranges.

Range System Overview

Telemetry - KSC

Radar - PAFB

Telemetry - KSC

Radar - CCAS

Telemetry - Antigua

Sat-Comm/Radar - Ascension

Range System Overview

Range Environment

- Range Assets provide critical National Support for the Space Program
  - High Value Legacy systems
  - Sensitive instrumentation
- Extensive corrosion due to site specific environmental conditions
  - Most sites located in harsh marine environments
  - PAFB/KSC site determined to be one of the most corrosive environments in U.S. 42 mils per year

Range Environment

PAFB, FL

Ascension Island, South Atlantic

Kaena Pt., Hawaii

Bermuda

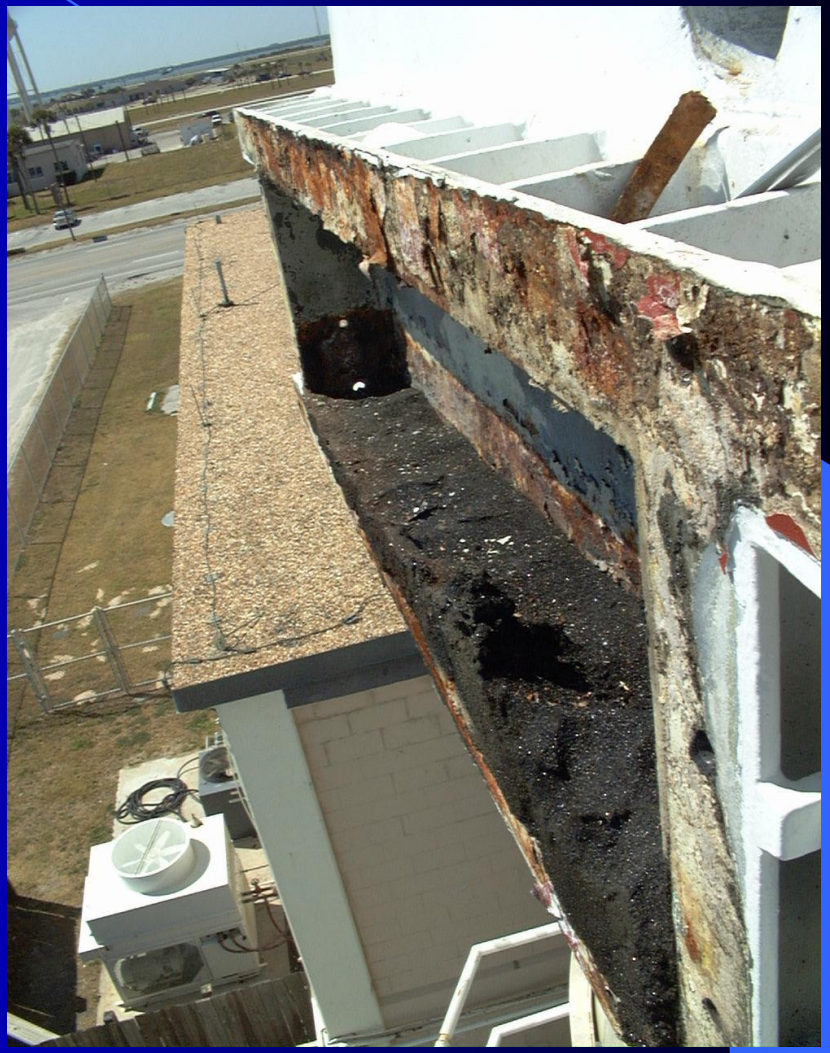
Corrosion Effects

Historical Perspective

- Previous Corrosion Control Efforts
  - Use of 3 coat system
    - I/O Zinc
    - Epoxy Midcoat
    - Polyurethane Topcoat
  - Service life of 3-5 years
- High Risk
- High maintenance = High Costs
    - Estimated 35% of maintenance budget
- Search for alternative coatings

Risk

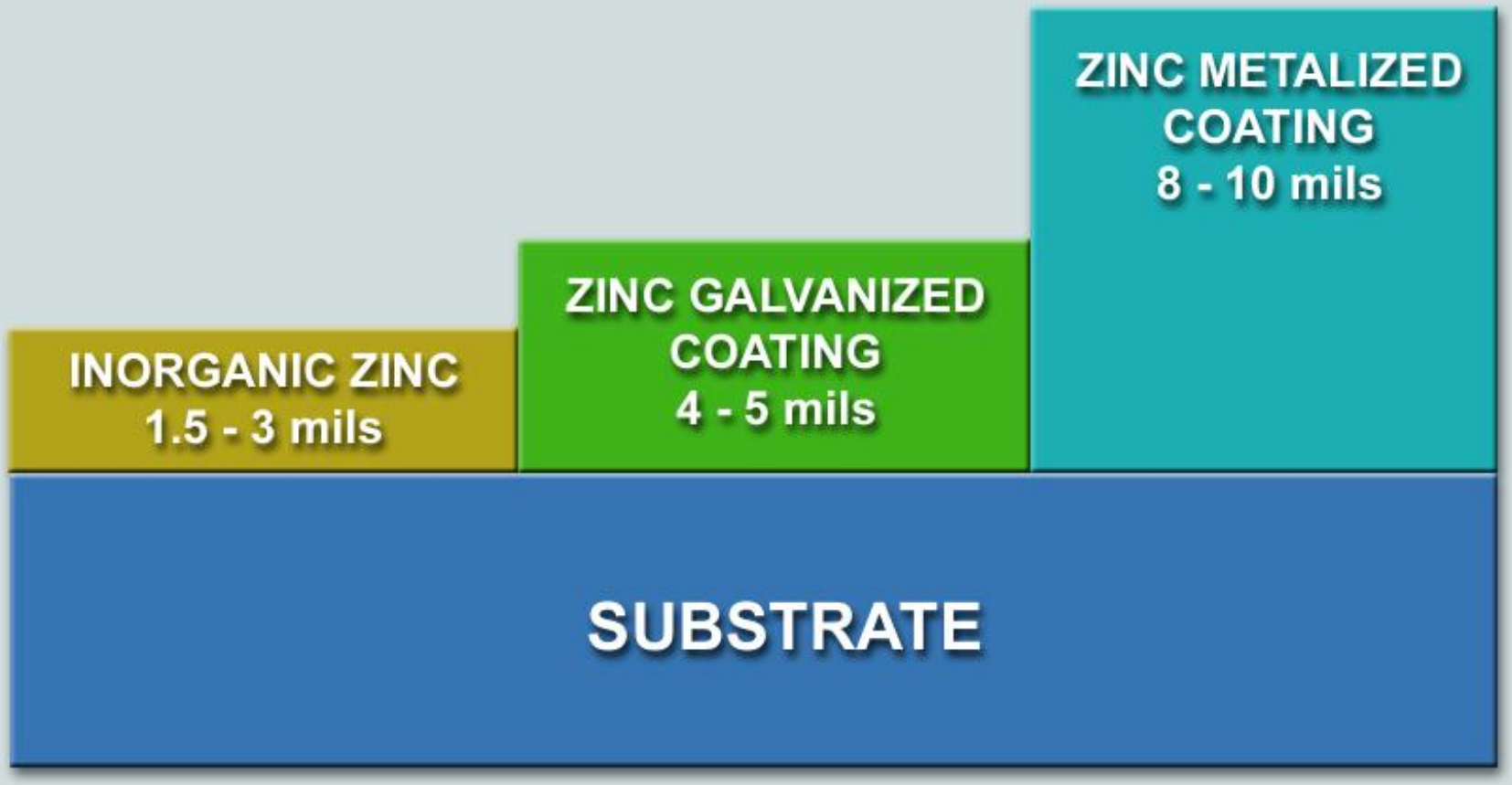
Proper coating preparation requires invasive abrasive blasting. This process can allow blast media particulate to collect in inaccessible areas and exacerbate the corrosion process.



Program Approach

- Recognized need for Zinc Rich Coating
  - Industry Standard for protection of steel substrates
  - Provides sacrificial protection
- Options:
  - Inorganic Zinc Primers
    - Difficult to apply
    - Temperamental
  - Galvanizing
    - Not suitable for field application
  - Metalizing

NOMINAL APPLICATION COATING COMPARISON



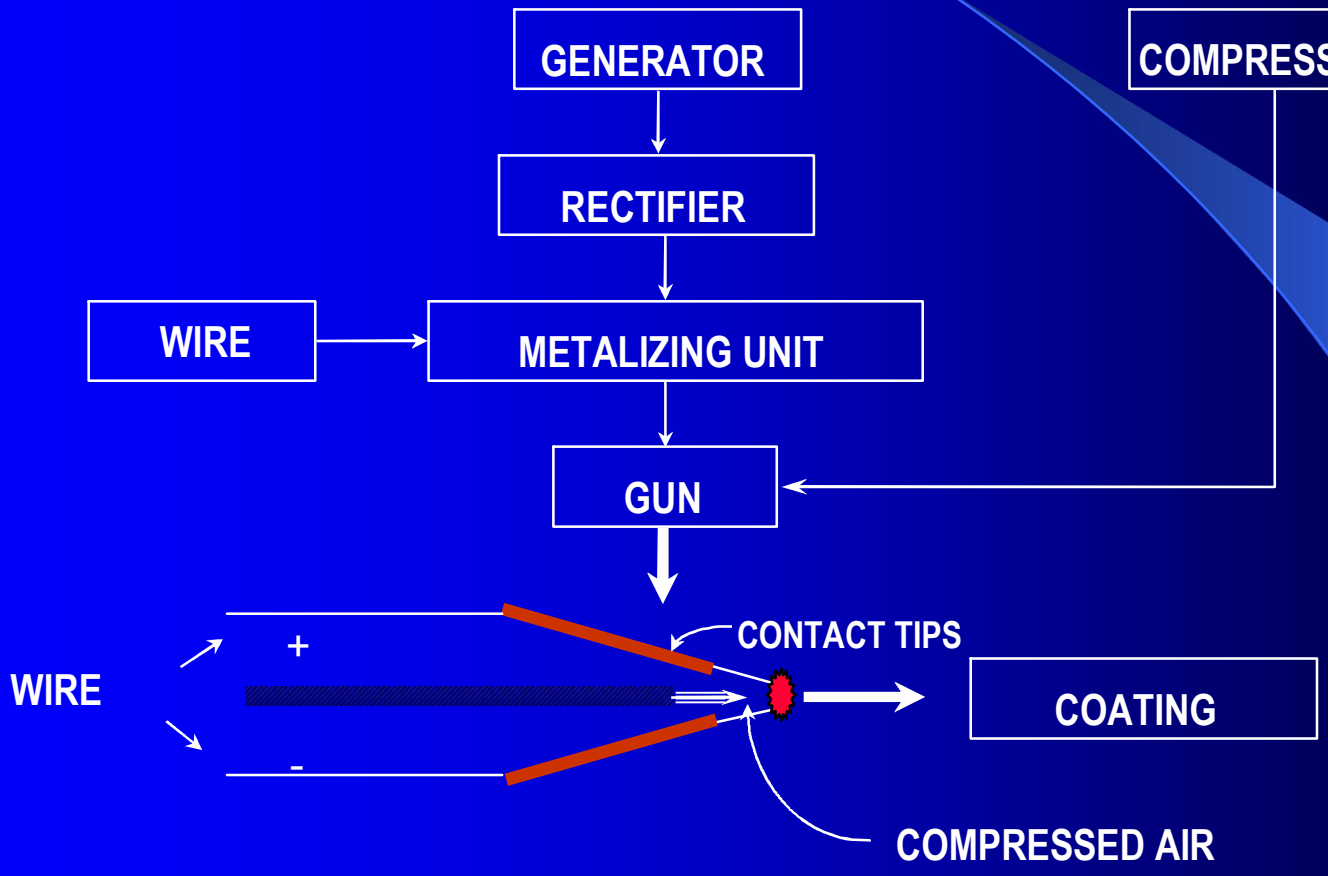
Range Metallization Program

- Alternative coatings investigated
  - designated Metalization as product of choice
  - Inorganic coating
- Established Metallization Program in 1998
  - over 30 major systems metalize to date
  - Adopted for use on Western range
- Instituted use of NACE/SSPC Standards
- NACE Certified Inspector Oversight

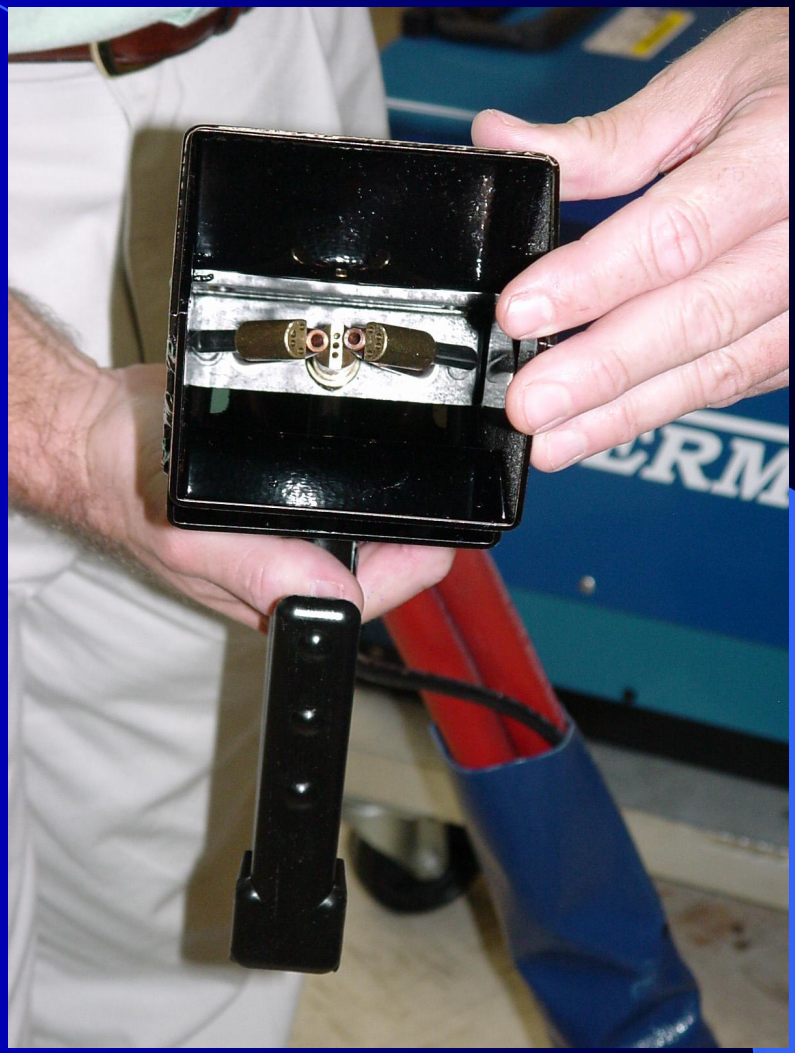
The Metalizing Process

- Also known as “Thermal Spray”
- Melting a metal
- Atomizing molten metal
- Propelling molten metal to a prepared substrate
- Results in a thin coated layer of metal

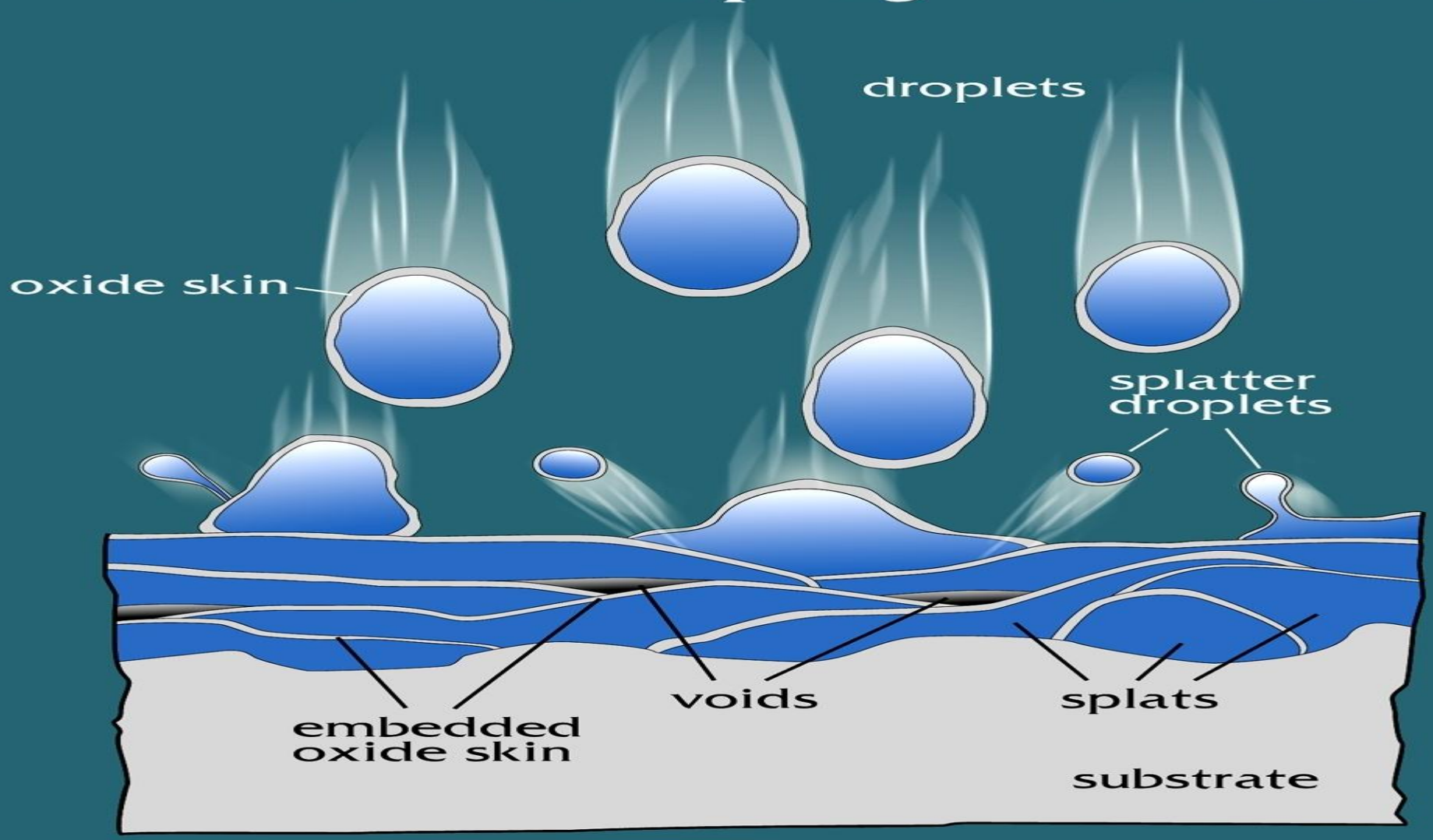
Wire Arc Metalizing System



Wire Arc Equipment



Thermal Spray Process



Safety Considerations

- Eye Protection
  - Minimum grade # 9 welding goggles
- Respiratory Protection
- Hearing Protection
- Non Sparking Soles
  - Dust Particulate explosion hazards
- Long Sleeves/Gloves
  - Flash Burns

Metal Arc Spray

ZINC

Aluminum

Al 80/20 Mg

Range Metallization Program

- System, surface preparation and Coating application is key
- Adherence to SSPC and NACE standards
  - SSPC CS Guide 23
  - ANSI/AWS C2.18
- System preparation critical to protect electronic packages and bearing surfaces

Metalizing Process

- Protection of Sensitive Equipment
- Surface Preparation
  - SSPC-SP-1 Solvent Clean
    - Pressure wash / Chloride removal
  - SSPC SP-5/NACE 1 White Metal Blast
    - 2-4 mill angular profile
- Metalizing Application
  - 8-10 mils
    - Right angle passes 2-3 mils per pass
- Seal coat
    - Usually within 8 hours or prior to visible oxidation
- Top Coating
  - Primarily cosmetic

System Access

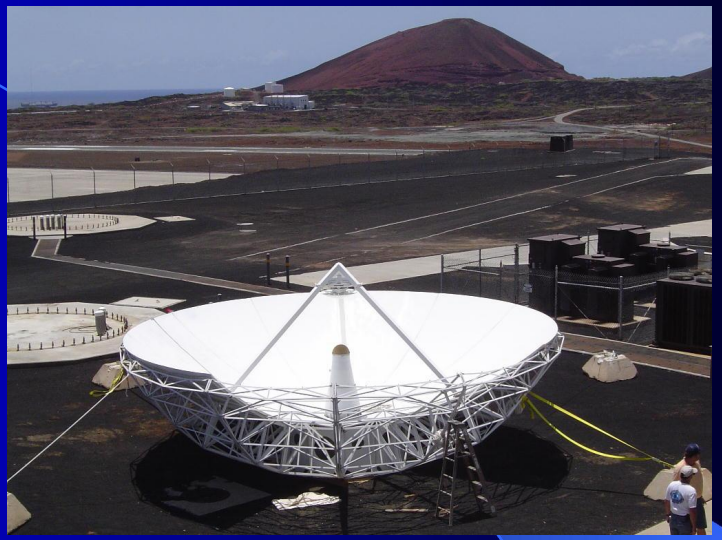
Counterweight interior (looking left)

The metalization process can be utilized in any areas accessible by conventional coating methods.

System Preparation

System Preparation

System Preparation(Continued)



System Preparation(Continued)

Larger systems may utilize scaffolding and tenting depending on site/environmental requirements.

Foam covering protects sensitive areas

System Preparation(Continued)

Lead based paint removal.

Heavy duty heat shrink wrap protects against blast media particulate.

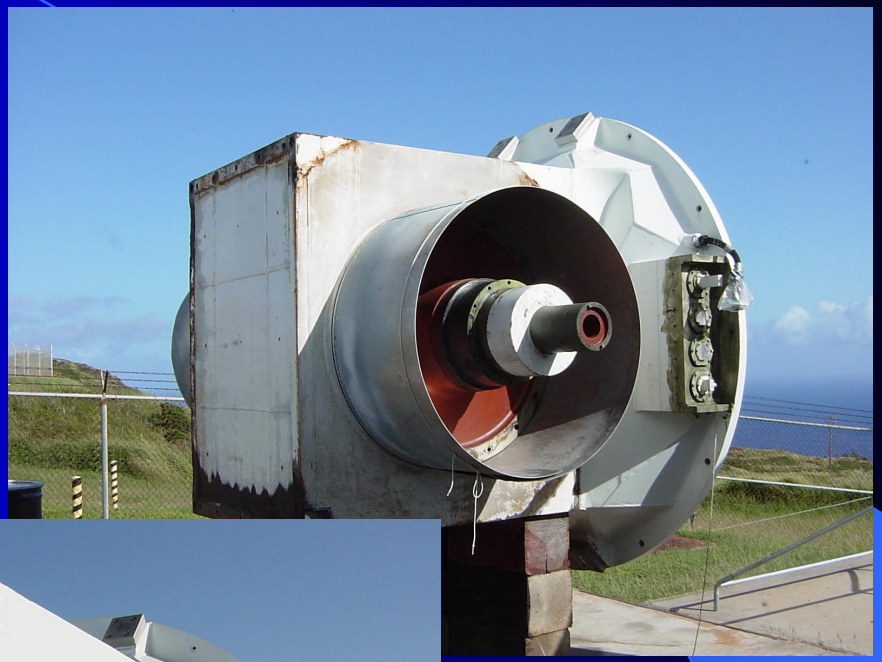
System Preparation(Continued)

Tarps are used to protect against abrasive blasting and Metalizing.

System Preparation(Continued)

Protective coverings, Parachute cord, putty and duct tape are used to protect bearing openings.

System Preparation (continued)



Metalizing Process

Metalizing Process (continued)

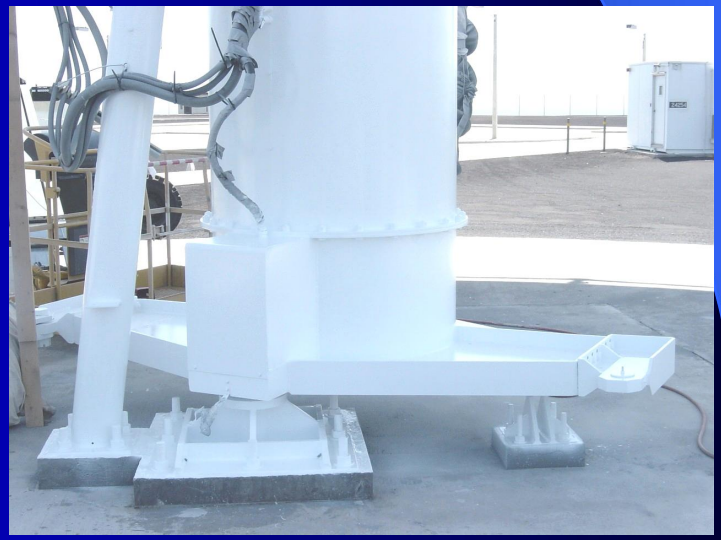
Metalization Process (continued)

Metallization Program Benefits

- Additional benefits of Metallization Program
  - System Downtime reduced
  - Increased Operational support
  - Risk to the system due to invasive processes minimized
  - Hazardous wastes reduced
  - Application reduces process time
    - saves steps in the coating process
  - Intangible cost savings
    - operations are not impacted
- Projected savings of $8.5 million

SATCOM 13m NW-1
Ascension

SATCOM 13m SE-2 Ascension



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Questions

Thank You

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